ten inches deep, will be moiſtned by it when melted; rivers, and ſprings recruited, as much as if a quantity of rain had fallen that covered the ſurface of the earth to the depth of one inch.

I am, my Lord,

with the greateſt reſpect,

your Lordſhip's moſt obedient

and moſt devoted humble ſervant,

Alex. Brice.

Received June 5, 1766.

XXVII. *Some Obſervations on the Country and Mines of* Spain *and* Germany, *with an Account of the Formation of the Emery Stone; from* William Bowles, *Eſq; Director General of the Mines of* Spain; *communicated by* P. Collinſon, *F. R. S.*

Read June 19, 1766.

AT the extremity of Old Caſtile, in Spain, is ſituated a territory called Montana, which is divided into two parts; the Low Montana is that chain of mountains, which bounds the

the Cantabrian Sea. The city Santander is its chief port, from whence you aſcend ſoutherly, twelve long leagues, a ſucceſſion of high craggy mountains, to the town of Reynoſa in the upper Montana, which extent ſtretches three leagues more, and then you continually deſcend about fourteen leagues to the city of Burgos, the capital of Old Caſtile.

Reynoſa is in the center of an open plain, ſurrounded by a ridge of high mountains, at whoſe feet are low hills of paſture-land.

To the weſt of Reynoſa, in an hour's walk, is the ſource of the great river Ebro, which receives all the waters on that ſide, and conveys them into the Mediterranean, ſeven leagues below the city Tortoſa.

All the ſpring, rain and ſnow waters, of the mountains to the north of Reynoſa, run into the Bay of Biſcay.

The waters, from the ſouth chain of the mountains, are collected in the river Piſverga, which runs into the river Duero, and from thence are carried to the Atlantic ocean at Oporto.

Hence we ſee, that the adjacent parts of Reynoſa divide the waters of the three ſeas, which lye north, eaſt, and weſt.

Eight leagues ſquare of this upper Montana is the higheſt land in Spain; the mountains riſe to the atmoſphere to the line of congelation; I ſee ſnow from my window this 4th of Auguſt, as writing this letter. Some years ago there uſed to fall ſo much ſnow, that the people were forced to dig lanes through it, to go to church, in the winter; but there has fallen little ſnow ſince the earthquake at Liſbon, and ſome years none at all. I am perſuaded, it changed the climates

of many parts of Spain; for no man living ſaw, nor heard his father ſay he ſaw, ſnow fall in or about the city of Sevil, until the year 1756.

I found many plants in theſe mountains, which I remember to have ſeen in Switzerland; they abound with oak, beech, birch, holly, aud hazel.

The hills and plains are fine paſture; I never ſaw a meadow in any other part of Spain, neither did I ſee horſes and cows feed on hay any where elſe.

Theſe mountains are formed of ſand-ſtone, lime-ſtone, plaſter-ſtone (or gypſum) and emery-ſtone.

The ſand-ſtone, is at the ſummit of the mountains, and ſome hills, and the lime-ſtone forms the body; but the contrary is ſeen in others, the ſand-ſtone abounds, and the plaſter is always loweſt.

As for example, the high mountain of Arandilla, which is a ſmall league off the town, is all ſand-ſtone at the ſummit; its body is a maſs of aſh-coloured lime-ſtone, in which is found impriſoned petrified cornu ammonis, and ſcollop ſhells; and there are beds of plaſter-ſtone at its foot, towards the plain; theſe join to a ſtratum of black marble veined white and yellow, which is no more than a purer kind of lime-ſtone, as all other marbles are.

On the hill to the eaſt of Reynoſa, and in the plain, are found great blocks of emery-ſtone, of which I will ſay a word, becauſe I think its nature is not truely known; at leaſt that of Spaniſh emery, which the looking-glaſs grinders of the king's fabric at St. Ildefonſo ſay is the moſt biting emery, they ever uſed; and I never ſaw any other in its native matrix.

That

That iron has been, and is now, in a fluid ſtate, percolating through the earth, and that it ſubſides, chryſtaliſes, or is precipitated, to form different bodies, is demonſtrated by the black and red bloodſtone, by ſome beautiful ſtalactites, which are almoſt pure iron, by the eagle-ſtone, by figured pyrites, by native vitriol, and by native crocus.

When this fluid iron penetrates a rock of ſand-ſtone, and only ſtains the ſurface of each grain, of a browniſh, reddiſh, or yellow colour, it becomes only ſand and crocus; but, when it is joined with the chryſtaline matter in a fluid ſtate, in the very act of chryſtaliſation of each grain of ſand it incorporates with it, its weight and hardneſs is increaſed, and then it becomes emery.

The earth of the mountains and hills is of the ſame nature as that of the rock below. If it is lime-ſtone, the ſoil caſt into any acid liquor will boil up with a violent effervescence, and the acid will diſſolve it.

If the rock below be ſand-ſtone, or plaſter-ſtone, or emery, the earth of that hill or mountain will remain quiet in the acid, and there is no effervescence nor diſſolution.

I have often obſerved, that, when the rocks below are mixed, calcary and noncalcary, the ſoil of the ſurface is alſo of a mixt nature; and I always found the action of the acid to be weak or ſtrong upon theſe earths, in proportion to the ſort of ſtone with which they abound.

Thirty one leagues ſouth eaſt of Madrid, and five leagues ſouth of the ſource of the river Tagus, is ſituated the town of Molina Aragon, capital of a

lordſhip of the crown, almoſt in the center of Spain; the high hills of this little territory are covered with pine trees; here I learned ſome truths, which prove, that the following opinions ought to be ranked amongſt vulgar errors.

Firſt, that ſalt-ſprings are not found in the high primitive mountains, but in the low hills and plains only.

The elevated town of Molina, and the rocky country about it, is formed of red and grey ſand-ſtone, lime-ſtone, white and grey granite. Theſe rocks contain either ſalt, or ſalt-petre; the houſes built of this ſtone are covered with the ſaline efflorescences, which are drawn out by the ſun after rain. The whole territory of Molina is full of ſalt ſprings; but there is a copious ſalt-ſpring, riſing out of a land yet higher than the ſource of the Tagus, and not far from it, which is one of the higheſt territories in all the inland parts of Spain, for it divides the waters of the ocean and Mediterranean. This ſpring furniſhes ſalt to the juriſdiction and biſhoprick of Albarrazen. There is beſides another ſalt ſpring, in another elevated ground, which ſupplies the eighty two towns and villages of Molina-Aragon with ſalt: beſides which, there is a ſalt ſpring, iſſuing out of a ſpot in the Montana, which is higher than the fountain of the Ebro, and about a quarter of a mile diſtant from it.

Secondly, that metallic vapours deſtroy vegetation; the following inſtances evince the contrary.

There are many iron, copper, lead, and pure pyritous ores, in theſe mountains; and yet the ſame plants, and the ſame ſweet graſs grow there as in other parts, of which I will give a more particular account.

About two hours walk northweſt of Molina, there is a little hill called Platilla; it extends about half a league over, from valley to valley; its body is a ſolid, rocky, white granite, through which run, in different directions, and without any order, an infinite number of blue, green, and yellow veins of rich copper oar, which holds a little ſilver, mineralized by a great quantity of arſenick and ſulphur: the very ſurface of the rock is in many places ſtained blue, and green, and the veins of oar are not above a foot deep. In the fiſſures, and in the ſolid rock, is contained lead oar, which is ſometimes found even on the ſurface; and yet the following plants grow out of the ſoil, which covers theſe arſenical ſulphurous veins, and is not more than a foot deep; true oak, flax, white thorn, juniper, cyſtus, wild-roſe, uva urſi, phlomis, verbaſcum, ſtœchas, ſage, thyme, ſerpillum, roſemary, and many others, which it would take up too much time to mention. The earth of this ſame hill is covered with the ſame ſweet ſmall graſs as the reſt of the country.

I have alſo made the ſame obſervations, out of Spain, at the three greateſt mines in Europe, viz. St. Mary of the mines in Alſatia; Clauſthal, in the Hartz-mountains of Hanover; and Frayberg, in Saxony.

The mines of St. Mary are at the head of a valley. Its hills are ſome of them covered with oak, pines, and others with apple, pear, plum and cherry, and others, with fine graſs downs. The tops of others are fields of wheat, which, in the year 1759, as I found by my notes, gave a produce of eight for one. All theſe vegetables grow in a ſoil, a foot or two deep, which

which covers a rock, full of the moſt arſenical, ſulphureous, ſilver, copper, lead, and cobalt ores, in Europe, and moſt of the veins are near the ſurface.

The mines of Frayberg are in low hills near the city. I ſaw them all covered with barley in July. A ſtranger would not imagine that men were reaping corn over hundreds of miners heads, who were blowing up veins of ore, arſenick, and brimſtone.

The mines of Clauſthal are in a plain, which, in truth, is the ſummit of a mountain; the Dorothy and Caroline veins of ſilver, lead, and copper ore, ſtretch away eight miles to the Wild-Man mountain; the fineſt meadows and ſweeteſt graſs are upon theſe veins, and all their branches near the city: they feed nine hundred cows, and two hundred horſes; they are mowed in June, and a ſecond crop ſprings up, which is mowed in Auguſt: a multitude of plants grow in theſe high meadows, over the mines.

It is true, I ſaw mines in the barren naked mountains and hills: but it is certain that their barrenneſs is not the effect of mineral vapours; but the air, moiſture, heat, and cold, have more power over the ſurfaces of ſome rocks, than of others, to moulder the ſtone into earth. Such is the high mountain of Ramelſberg, above Goſlar, whoſe inhabitants have lived by the mines found therein. I crept up this ſteep rock to its ſummit; I found it ſplit and cracked into millions of fiſſures, from one foot to an inch wide; in other places, it was ſhivered into ſmall rotten ſtones, which became a receptacle for a few plants, graſs, moſs, &c. and, as this decayed ſtone moulders into earth, it will be more abundant in vegetable productions; this may, perhaps, have been the origi-

nal ſtate of thoſe mountains, which are now covered with verdure.

Communicated by

Madrid,
Jan. 1765.

P. Collinſon.

XXVIII. *Commentarius de indole Electrica Turmalini, auctore* Torberno Bergman, *Mathematum & Philoſophiæ Naturalis ad Reg. Academiam* Upſ. *adjuncto, Academiæ Imper. N. C. Academiæ Reg. Scientiarum* Stockholmenſis *& Societatis Regiæ* Londinenſis *membro.*

Read Nov. 20, 1766.

I. CUM circa finem anni præteriti quinque ſelecti turmalini, ab Academia Regia Scientiarum Stockholmenſi nuper adquiſiti, in meas inciderent manus, venia illuſtris hujus Societatis varia hiſce inſtitui tentamina, ut ſingularium horum lapillorum naturam, ſi fieri poſſet, penitius expiſcarer. Fateri vero convenit, me parum ſucceſſus ſperaſſe, poſtquam celeberrimi noſtri ævi phyſici, Æpinum loquor & Wilſonum, turmalinum adtentione, viris hujus ordinis propria, ſcrutati fuerant. Et ſane, ſi res eſſet dijudicanda ex numero ſcriptorum admodum parvo,